

Water quality of Someș river downstream of Cluj-Napoca city

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INTRODUCTION

Small rivers are the focus of scientists around the world, as they have become the main receptors of the most diverse pollution sources. River water pollution in Romania is mainly due to agricultural activities, urban agglomerations and industrial activities. In the Someș Mic river the main source of pollution is the discharge of insufficiently or partially treated wastewaters.

The objective of the study was to assess the concentration of metals in water downstream of Cluj-Napoca city using the metal pollution index.

SAMPLING

Water samples were seasonally collected from the Someș Mic, downstream of the Cluj-Napoca (S1), upstream Gherla (S2) and downstream of Dej (S3) towns during 2016 and 2017. Water temperature, electrical conductivity and pH were measured on site, WTW multi-parameter. The water samples were taken with a scoop angular polypropylene beaker of 2L with telescopic rod. Immediately after sampling, water was filtered using a 0.45 μm pore size cellulose acetate membrane filter and acidified with 65% ultra-pure HNO₃.

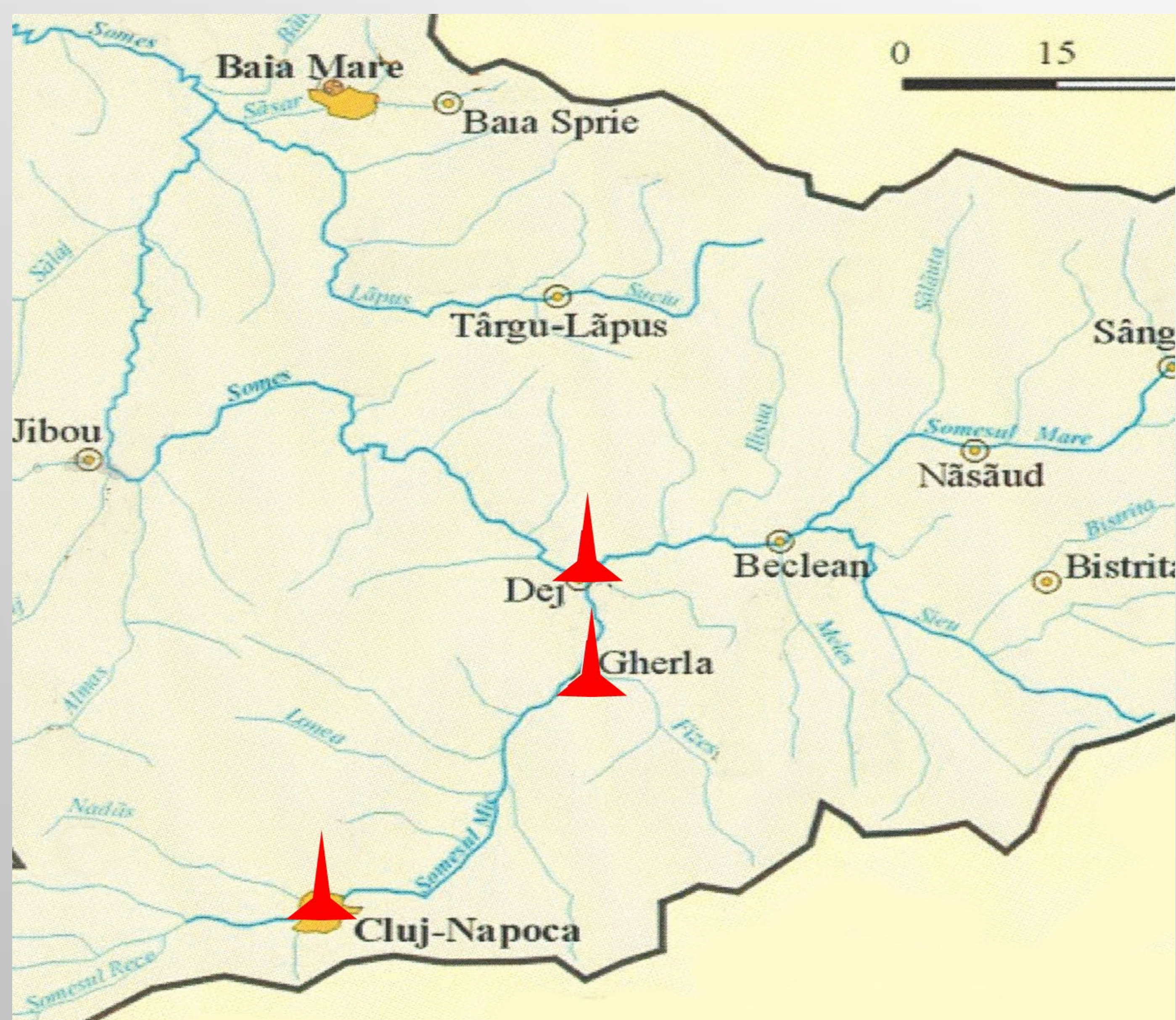


Figure 1. Water sampling points in the Someș Mic river

ANALYSIS

The concentration of metals was determined by inductively coupled plasma mass spectrometry using an Elan DRC II (Perkin Elmer, US) spectrometer. Soil samples (1 g) were digested with 28 ml *aqua regia* (7 ml of 65% HNO₃ and 21 ml of 37% HCl) on a sand bath for at least 2 h and diluted to 100 ml with ultrapure water.

ACKNOWLEDGEMENTS

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INSTRUMENT AND METHODS

Elan DRC II inductively coupled plasma mass spectrometer (ICP-MS) was used for all measurements. Before each batch of samples, the spectrometer was optimized for best signal/noise ratio. The instrument uses a quadrupole as a mass filter and a single detector and the dynamic reaction cell (DRC) was used in *rf-only* mode (vented).

A quantitative method was used for all sample measurements and a calibration curve in 6 points (between 1 and 100) was obtained by dilution of a multielement solution (Perkin Elmer Standard 3).

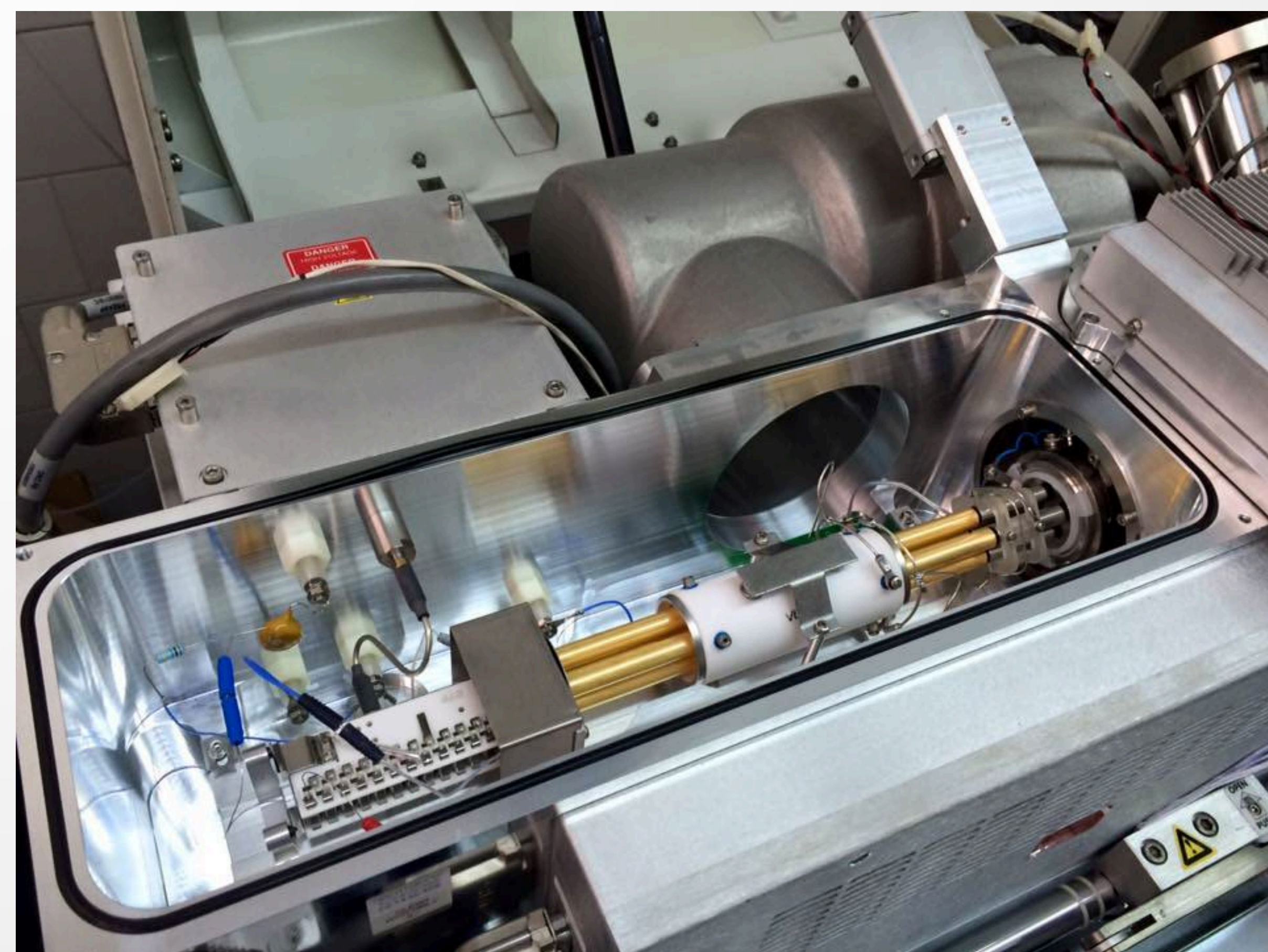


Figure 2. Elan DRC II ICP-MS instrument

RESULTS AND DISCUSSIONS

The low values of metals indicate there is no significant source of metal pollution in Someș Mic river. The highest concentrations of Pb (1.2 μg/L) and Cd (1.9 μg/L) were observed in Someș Mic river during spring.

The MPI values for Pb, Ni, Cu and Zn were below 1.0, (class II) for Someș Mic river. The low values of metal pollution index (MPI) calculated for Cr, Zn, Mn, Pb, Ni, Cu and Cd suggested that the water of Someș Mic can be used in operation of ecosystems, fisheries, drinking water supply, supplying water to industries requiring equivalent water quality, recreational activities, irrigation; hydroelectric power generation and transport.

CONCLUSIONS

The present study reveals that most of the water samples of Someș Mic have low content of metals, the waters being classified as unpolluted or slightly polluted with metals, whilst the pollution profile have a seasonal variation. The mean seasonal concentrations follow a descending order of Mn>Cr>Cd>Cu>Ni>Zn>Pb.